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IS 10830 (1984): Gymnastic equipment-Landing mats and surfaces for exercises-Determination of hardness and impact damping [PCD 22: Sports Goods]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

SPECIFICATION FOR GYMNASTIC EQUIPMENT —
LANDING MATS AND SURFACES FOR FLOOR EXERCISES —
DETERMINATION OF HARDNESS AND IMPACT DAMPING
(ISO Title : Gymnastic Equipment — Landing Mats and Surfaces
for Floor Exercises — Determination of Hardness and Impact Damping)

National Foreword

This Indian Standard, which is identical with ISO 5903 - 1981 'Gymnastic equipment — Landing mats and surfaces for floor exercises — Determination of hardness and impact damping' issued by the International Organization for Standardization (ISO), was adopted by Indian Standards Institution on the recommendation of the Sports Goods Sectional Committee and approved by the Consumer Products and Medical Instruments Division Council.

Comma (,) has been used as a decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.

Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

In this Indian Standard the following International Standards are referred to whose corresponding Indian Standards are also given. Read the corresponding Indian Standard wherever a reference to an International Standard appears :

International Standard	Corresponding Indian Standard	Degree of Correspondance
ISO 5905-1980 Gymnastic equipment — Landing mats (2000 mm × 1250 mm × 60 mm)	IS : 10831-1984 Specification for gymnastic equipment — Landing mats (2000 mm × 1250 mm × 60 mm)	Identical
ISO 5906-1980 Gymnastic equipment — Surfaces for floor exercises — Mats	IS : 10832-1984 Specification for gymnastic equipment — Surfaces for floor exercises — mats	Identical
ISO 5907-1980 Gymnastic equipment — Surfaces for floor exercises — Boards	IS : 10833-1984 Specification for gymnastic equipment — Surfaces for floor exercises — Boards	Identical

1 Scope and field of application

This International Standard specifies a method for the determination of the hardness and impact damping of gymnastic landing mats and surfaces (mats and boards) for floor exercises for use in competitions and training, in order to

a) ensure that for competitions and training, mats and surfaces for floor exercises are used, the hardness and impact damping of which lie in a specified range;

b) reduce the risk of injury to the gymnasts.

NOTE — These properties shall be considered as being the essential characteristics for the use of these products.

2 References

ISO 5905, *Gymnastic equipment — Landing mat*.

ISO 5906, *Gymnastic equipment — Surfaces for floor exercises — Mats*.

ISO 5907, *Gymnastic equipment — Surfaces for floor exercises — Boards*.

3 Principle

Dropping, from a specified height, a test piece on to the horizontally placed landing surface of the gymnastic landing mat or surface for floor exercises. Recording of the position of the test piece after sinking in and rebounding.

4 Apparatus

4.1 Test device, the design of which is at the option of the tester, however, the frame of the device shall not influence the test result.

4.2 A cylindrical test piece made of steel, having a mass of 10 kg and a diameter of 100 mm, positioned at a height $h = 400$ mm above the landing surface of the gymnastic landing mat or surface for floor exercises. The external edge of the rebound surface of the cylindrical test piece being rounded with a radius $R = 6 \pm 1$ mm.

4.3 Registering device, mechanical or electronic, for recording the greatest depth of penetration P and the greatest height of rebound R .

The field of fluctuation of the six individual values at one measuring point shall not exceed 3 mm for the depth of penetration P and shall not exceed 10 mm for the height of rebound R .

4.4 Levelling indicator.

5 Procedure

Carry out the tests at an ambient temperature of $20 \pm 3^\circ\text{C}$.

Place the parts to be tested on a solid, flat and horizontal floor, such as a concrete floor at least 80 mm thick.

Place the test device (4.1), by means of a levelling indicator (4.4), on the parts to be tested in such a way that the guide tube for the test piece (4.2) is vertical.

Record, by means of registering device (4.3), P and R .

Carry out eight measurements for each measuring point. The position and number of the measuring points are indicated in ISO 5905, ISO 5906 and ISO 5907.

The first two measurements at each measuring point shall not be used.

Take the mean values of the other six measurements and base the total mean value on them.

Record P on the measuring diagram to the nearest 0.5 mm and R to the nearest 1 mm.

6 Expression of results

The following values shall be recorded and calculated respectively :

P the greatest depth of penetration in millimetres of the test piece into the landing mat and on the surface for floor exercises respectively, taken as the value for hardness;

R the greatest height of rebound, in millimetres, of the test piece taken as the value for impact damping;

N the number of rebounds of the test piece after first rebound on the mat, also taken as a value for impact damping.

NOTE — In determining the number *N* of rebounds, only those with a height of at least 10 mm should be counted.

Instead of direct measuring, *N* may be given by the formula

$$N = \left\{ \begin{array}{l} \ln \frac{h}{M} \\ \ln \frac{h}{R} \end{array} \right\}$$

where

h = 400 mm;

R is the largest height of rebound, in millimetres;

M is the minimum height of rebound, in millimetres.

NOTE — The square brackets indicate that when the value for the expression in brackets lies between two integral numbers, the smaller integral number shall be taken for *N*. With *h* = 400 mm and *M* = 10 mm the result is:

$$N = \left[\frac{3,69}{5,99 - \ln R} \right]$$

In the case of different results for *N* between the measured and calculated value, the measured value shall be taken.

The coefficient of impact damping, ϵ , as an additional measure for impact damping, is given by the formula

$$\epsilon = \frac{1}{2\pi} \times \ln \frac{h}{R}$$

where *h* = 400 mm.

7 Notes on procedure

7.1 On the basis of extensive practical experiments on gymnastic landing mats and surfaces for floor exercises (mats and boards) the criteria for the characteristics of these products and the appropriate test methods have been drawn up. These are described in this International Standard.

7.2 It was found that, above all, hardness (or softness) and impact damping are the decisive characteristic qualities for gymnastic landing mats and surfaces for floor exercises. The test method is based on the analysis of movement during landing and the evaluation of the energy level. The test piece having a mass of 10 kg and falling from a height *h* of 400 mm, causes about the same transfer of energy into the landing surface as the gymnast.

7.3 As a function of, for example the thickness of the gymnastic landing mat, the greatest depth of penetration *P* is a measure of the time which is at the disposal of the gymnast for landing. On the other hand, the greatest height of rebound *R* depends on the design of the gymnastic landing mat and measures the deformation hollow which increases with the decrease in *R*. This is important for ensuring a safe landing for the gymnast and enables him to avoid incorrect landing on the surface, directly before the phase of highest consumption of energy and enables him to avoid injury.

8 Test report

The test report shall include the following particulars :

- reference to this International Standard;
- description of the object tested;
- individual values and mean values of *R* and *P* for each measuring point;
- total mean values of *R* and *P*;
- fields of fluctuation of the mean values of *R* and *P* of the individual measuring points;
- any deviation from this International Standard and reasons for this deviation;
- date of test.

If desired :

- number *N* of rebound of the test piece;
- coefficient of impact damping, ϵ .